

WHAT IS CLAIMED IS:

1. A method of enhancing the image resolution in a lithographic system, comprising:

decomposing a reticle pattern into at least two constituent sub-patterns;

coating a substrate with a pre-specified photoresist layer, said pre-specified photoresist layer having reduced memory reaction characteristics;

exposing a first of said at least two constituent sub-patterns by directing a projection beam through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto said pre-specified photoresist layer of said substrate;

processing said exposed substrate;

exposing a second of said at least two constituent sub-patterns by directing said projection beam through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said pre-specified photoresist layer of said substrate,

wherein said exposing combines said first and second sub-pattern images to produce a desired pattern on said substrate.

2. The method of Claim 1, wherein said lithographic system is capable of optically resolving pattern features that correspond to a half-pitch lower limit k_1 greater than 0.25 and said desired pattern is exposed with features that correspond to a half-pitch lower limit k_2 less than or equal to 0.25.

3. The method of Claim 2, wherein said processing includes,
baking said substrate having said first sub-pattern image on said photoresist layer,
and

shifting said substrate, in said lithographic system, by a predetermined distance, in order to interleave said second sub-pattern image with said first sub-pattern image.

4. The method of Claim 3, further including applying a developer solution to said substrate.

5. The method of Claim 4, wherein said processing is optimized by employing specific bake times and temperatures.

6. The method of Claim 5, wherein said photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.

7. The method of Claim 3, wherein said processing further includes, applying a developer solution to said substrate, and shifting said substrate, in said lithographic system, by a predetermined distance, in order to combine said second sub-pattern image with said first sub-pattern image.

8. The method of Claim 7, further including baking said substrate having said second sub-pattern image and a developed first sub-pattern image on said photoresist layer.

9. The method of Claim 8, wherein said processing is optimized by employing specific bake times and temperatures.

10. The method of Claim 9, wherein said pre-specified photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.

11. An enhanced image resolution lithographic system, comprising:
a coating station configured to apply a photoresist layer onto a substrate, said photoresist layer configured to exhibit reduced memory reaction characteristics;
an exposure apparatus to expose a reticle pattern onto said substrate; and
a processing station configured to process a substrate exposed by said exposure apparatus,

wherein said reticle pattern is decomposed into at least two constituent sub-patterns that can be optically resolved by said exposure apparatus,

wherein a first of said at least two constituent sub-patterns is exposed onto said substrate by said exposure apparatus to produce a first sub-pattern image onto said photoresist layer of said substrate and said exposed substrate is processed by said processing station, and

wherein a second of said at least two constituent sub-patterns is exposed onto said substrate by said exposure apparatus to produce a second sub-pattern image onto said photoresist layer of said substrate and said first and second sub-pattern images are combined to reproduce said reticle pattern.

12. The system of Claim 11, wherein said exposure apparatus is capable of optically resolving pattern features that correspond to a half-pitch lower limit k_1 greater than 0.25 and said desired pattern is exposed with features that correspond to a half-pitch lower limit k_1 less than or equal to 0.25.

13. The system of Claim 12, wherein said processing station includes a baking station configured to bake said substrate having said first sub-pattern image on said photoresist layer.

14. The system of Claim 13, further including shifting said substrate by a predetermined distance, in order to combine said second sub-pattern image with said first sub-pattern image.

15. The system of Claim 14, further including applying a developer solution to said substrate.

16. The system of Claim 15, wherein attributes of said baking are optimized by employing specific bake times and temperatures.

17. The system of Claim 16, wherein said photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.

18. The system of Claim 13, wherein said processing station further includes, a baking station configured to bake said substrate having said first sub-pattern image on said photoresist layer, and
a developer station to apply developer solution to said substrate.

19. The system of Claim 18, further including shifting said substrate by a predetermined distance, in order to combine said second sub-pattern image with said first sub-pattern image.

20. The system of Claim 19, further including baking said substrate having said second sub-pattern image and a developed first sub-pattern image on said photoresist layer.

21. The system of Claim 20, wherein attributes of said baking are optimized by employing specific bake times and temperatures.

22. The system of Claim 21, wherein said photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.

23. A device manufacturing method comprising:

- providing a substrate coated with a photoresist layer having reduced memory reaction characteristics;
- providing a beam radiation;
- employing a patterning device to impart said beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns;
- exposing a first of said at least two constituent sub-patterns by directing said beam of radiation through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto said pre-specified photoresist layer of said substrate;
- processing said exposed substrate;
- exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said pre-specified photoresist layer of said substrate,

wherein said exposing combines said first and second sub-pattern images to produce a desired pattern on said substrate.

24. The device manufacturing method of Claim 23, wherein said desired pattern is exposed with features that correspond to a half-pitch lower limit k_1 less than or equal to 0.25.

25. The device manufacturing method of Claim 24, wherein said processing includes,

- baking said substrate having said first sub-pattern image on said photoresist layer,
- and
- shifting said substrate by a predetermined distance in order to interleave said second sub-pattern image with said first sub-pattern image.

26. The device manufacturing method of Claim 25, further including applying a

developer solution to said substrate.

27. The device manufacturing method of Claim 26, wherein said processing is optimized by employing specific bake times and temperatures.

28. The device manufacturing method of Claim 27, wherein said photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.

29. The device manufacturing method of Claim 25, wherein said processing further includes,

applying a developer solution to said substrate, and
shifting said substrate by a predetermined distance, in order to combine said second sub-pattern image with said first sub-pattern image.

30. The device manufacturing method of Claim 29, further including baking said substrate having said second sub-pattern image and a developed first sub-pattern image on said photoresist layer.

31. The device manufacturing method of Claim 30, wherein said processing is optimized by employing specific bake times and temperatures.

32. The device manufacturing method of Claim 31, wherein said photoresist layer further comprises a polymer resin compound, a photo-acid generator component, and a base component.